

CALIFORNIA'S STATE HIGHWAY

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STATE OF CALIFORNIA.

*(Read at the meeting of the Pacific Highway Association
at San Francisco, August 5, 1912)*

OUTLINE MAP OF CALIFORNIA

OFFICE OF
CALIFORNIA HIGHWAY COMMISSION

SACRAMENTO-CALIFORNIA

DIVISION ENGINEERS, OFFICE ADDRESSES.

Div. I	F. G. Somner,	Willits,	Mercantile Bldg.
Div. II	T. A. Bedford,	Redding,	C. R. Briggs Bldg.
Div. III	W. S. Caruthers,	Sacramento,	Forum Building.
Div. IV	A. E. Ioder,	San Francisco,	Rialto Building.
Div. V	W. C. Howe,	San Luis Obispo,	Union Nat. Bank Bldg.
Div. VI	J. B. Woodson,	Fresno,	Forsythe Building.
Div. VII	W. L. Clark,	Los Angeles,	Union Oil Building.

LEGEND

- ◆◆◆◆ Denotes surveys ordered.
- Denotes Contracts let or Advertised.
- Denotes Division Headquarters.

Corrected to August 1st 1918.



0 10 20 30 40 50 60 70 80 90 100
SCALE OF MILES

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BY

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THE COMMISSION.

The California Highway Commission has been engaged in its duties very nearly one year. On August 7, 1911, the appointed members of the Advisory Board of the Department of Engineering, Messrs. Towne, Blaney and Darlington, were commissioned by the Governor, and as soon thereafter as possible the Advisory Board appointed them as an Executive Committee of the department to be known as the California Highway Commission, giving to them as complete control over State Highway matters as the law permits.

STATE HIGHWAY ROUTES.

California, unlike the Eastern states, did not provide for a Commission to investigate the needs of the State in the matter of highways before appropriating money for their construction. The California State Highways Act, which is the law and the gospel under which the State Highway routes must be selected, and in accordance with which the roads must be built, in a general way, outlines the routes.

In the language of the Act: "The route or routes of said State Highways shall be selected by the Department of Engineering, and said route shall be so selected and said highways so laid out and constructed or acquired as to constitute a continuous and connected State Highway system running north and south through the State, traversing the Sacramento and San Joaquin Valleys and along the Pacific Coast by the most direct and practicable routes, connecting the county seats of the several counties through which it passes and joining the centers of population, together with such branch roads as may be necessary to connect therewith the several county seats lying east and west of such State Highway."

The precise meaning of the section of the Act just quoted has given the public, the Commission and its legal advisers food for much thought.

There is no doubt that a line down the coast and a line down the Sacramento and San Joaquin Valleys were contemplated, but how to connect the county seats and the centers of population by the "most direct and practicable routes," and to connect the county seats east and west of the State Highways by branches so as to satisfy the law and the people is a problem difficult of solution.

Fortunately, except in perhaps a half dozen instances, it seems probable that there will be no serious disagreement as to the proper location for the routes.

It is natural that each community should wish to have the main line of the highway pass through its borders, and it is obvious that such a line would be so meandering as to be impossible because of its indirectness and consequently greatly increased length.

The Commissioners have been obliged to take a broad view of the subject. The State Highway system must be planned from a State-wide view point, and no undue emphasis should be given to the desires of the communities themselves. In the absence of rulings by the Courts, it would seem that the command of the statute that the State Highway shall follow the "most direct and practicable routes" clothes the Commissioners and the Advisory Board with a good deal of discretion in locating the lines of the highways.

Acting upon that belief the Commission has, in a few instances, proposed to locate the main route of the highway in such a manner that one or more county seats would not be on it, and could reach it only by a lateral. In several cases such action has aroused a storm of protest. All sorts of reasons have been credited to the Highway Commission and to the Administration, it having been even alleged that the State Highways are being routed for political purposes, and to buy votes. It hardly seems to be worth while to deny such allegations. The writer disclaims any close acquaintance with so-called practical politics, but he has been engaged in public work for so many years that he believes himself able to smell the animal when it is prowling about. Not only has he seen no evidence of politics in highway routing, but on the contrary the accredited friends of the Administration have abused the Highway Commissioners for their proposed routings more than have its enemies.

The highway work, in all its roots and branches, has been and is singularly free from the sinister machinations of practical politicians.

Early in its work the Commission chose certain main routes as follows:

Route 1. San Francisco to Oregon line.....	(421 miles)
Route 2. San Francisco to San Diego via Los Angeles.....	(592 miles)
Route 3. Sacramento to Oregon line via east side of river and Redding	(344 miles)
Route 4. Sacramento to Los Angeles via San Joaquin Valley.....	(445 miles)
Route 5. Stockton to Santa Cruz via Oakland.....	(133 miles)
Route 6. Sacramento to Woodland Junction.....	(20 miles)
Route 7. Tehama to Benicia.....	(191 miles)
Route 8. Hopland to Vallejo via Lake County.....	(107 miles)
Route 9. Los Angeles to Riverside.....	(46 miles)

These routes make a total length of approximately 2300 miles. To complete the system apparently contemplated by the statute several hundred miles more of laterals and connections must be provided for.

ORGANIZATION.

In order to secure what the Commission considered the most efficient organization, conforming to the lines of the best practice among the large corporations, the following plan was adopted:

The Highway Engineer was made Chief Executive, corresponding in his relations to the different departments of the Commission to the General Manager of a large private corporation. Without reference to the public character of this work, the plan of dividing responsibility is along the same lines as if this Commission were a private corporation engaged in the business of building roads. The Highway Engineer (or Chief Executive) has directly responsible to him the following divisions or departments of the work:

Engineering Department.

Which is under the working supervision of the Assistant Highway Engineer. The work of this department is divided into eight subdivisions, viz: The Headquarters, the Division Numbers I, II, III, IV, V, VI and VII, which represent the headquarters of work in the different parts of the State. Each one of these divisions is in charge of a Division Engineer, reporting directly to the Headquarters office.

Purchasing Department.

Reporting directly to the Highway Engineer is the Purchasing Department, which will be in charge of all purchases, materials, equipment, etc., and will also have control and direction of the traffic work later on when the department is transferring material and equipment from one place to another. Up to the present time the Highway Engineer has been handling this department of the work with his engineering staff.

Accounting Department.

Reporting directly to the Highway Engineer is the Accounting Department, which is responsible for the records and accounts of the Commission. The work of this department is transacted chiefly in the headquarters office, building up from records and reports sent in from the division offices.

Finance and Disbursing Department.

This department reports directly to the Highway Engineer, and is responsible for the disbursing of all moneys from both the headquarters and division offices.

Legal Department.

This department reports directly to the Highway Engineer, and handles all matters in which legal rulings are involved, such as decisions on legal problems that are constantly confronting the Highway Engineer, and such matters as rights of way, condemnation suits, etc.

The total number of people in the employ of the Commission July 15, 1912, was 260, and the following table shows them classified by divisions:

	Headquarters.	I.	II	III.	IV.	V.	VI.	VII.	Total.
Secretary	1	..	..	..	..	..	..	..	1
Assistant Secretary	1	..	..	..	..	..	..	..	1
Assistant Highway Engineer..	1	..	..	..	..	..	..	..	1
Division Engineers.....	..	1	1	1	1	1	1	1	7
Principal Assistant Engineer..	..	1	1	1	1	1	1	1	7
Attorney	1	..	..	..	..	..	..	..	1
Right of Way Agent.....	1	..	..	..	..	..	..	..	1
Accountants and Clerks.....	3	1	1	1	1	1	1	1	10
Stenographers	4	..	..	..	1	1	1	1	8
Typists	1	..	..	..	..	..	..	..	1
Messenger	1	..	..	..	..	..	..	..	1
Geologist	1	..	..	..	..	..	..	..	1
Testing Engineer	1	..	..	..	..	..	..	..	1
Draftsmen and Computers	5	4	5	5	6	5	4	7	41
Chiefs of Party.....	..	4	4	4	5	4	3	6	30
Instrument Men .....	..	4	4	4	6	4	4	6	32
Rodmen .....	..	8	7	9	12	8	11	8	63
Axmen .....	..	5	2	3	5	4	..	3	22
Teamsters .....	..	1	3	..	..	4	..	4	12
Cooks .....	..	4	4	..	..	4	1	6	19
	—	—	—	—	—	—	—	—	—
	21	33	32	28	38	37	27	44	260

The chiefs of party, instrument men, rodmen, axmen, teamsters and cooks are grouped in thirty-one survey parties of four to eight men each, the number of men depending upon the nature of the work and the character of the country.

With the exception of the Secretary, his assistant and the attorney, all employees of the Commission have been required to file applications stating their experience and giving references as a prerequisite to employment. The writer, who has recommended for employment 257 of the total 260 employees, is happy to be able to assert that he does not know the political inclination of any one of them. They were all selected because they were supposed to be especially fitted for the duties entrusted to them.

The payroll for the month ending July 15, 1912, shows that the average monthly salary of the 260 employees already accounted for is \$91.02.

SURVEYS ORDERED AND MADE.

From time to time since January 1, 1912, the Commission has ordered surveys on the various routes as fast as general routing problems were settled. In some cases reconnaissances only were ordered. In others two or more surveys were ordered between objective points to determine which was the

best. At the present time thirty-one survey parties are engaged in such work, and the surveys are proceeding as rapidly as careful work will permit.

The survey notes go from the field to the division offices, where the plans are made by the draughtsmen. Ultimately they are sent to the headquarters at Sacramento with the reports of the Division Engineers for revision and correction when necessary.

To this date approximately 1500 miles of road survey have been ordered by the Commission, and of this mileage nearly 800 miles of field work has been completed, and more than 200 miles in addition is in process. The survey orders were carefully distributed throughout the seven divisions, and no portion of the State is being neglected.

The surveys ordered and made are considered as tentative only, and when necessary the lines are changed to conform to new conditions which arise, but, as a rule, the Commission has given earnest consideration to the needs of the State before ordering the surveys. Even in the flat country such surveys cost too much money to be ordered at random.

QUALITY OF ROADS.

In brief the standard road which the Commission proposes to build will have the following principal characteristics:

1. A right of way not less than 60 feet in width where it is reasonably possible, and as direct between objective points as is consistently possible.
2. Gradients not exceeding 7%, even in the mountainous parts of the State.
3. Curves as open as possible, and in no case of less than 50 feet in radius.
4. As many culverts of sufficient capacity as are needed to take care of surface and underground water.
5. A traveled way under ordinary conditions not less than 21 feet in width, and in the mountains not less than 16 feet wide, with the center paved or surfaced so as to be hard and smooth under all climatic conditions at all times of the year, the width of surfacing to be in general 15 feet.
6. Smoothly graded roadsides, reserved for future tree planting.

For the main roads of the system the choice for surfacing seems to lie between the so-called oil macadam type and a concrete road with a bituminous surface, the latter being considerably more expensive than the former, but much more desirable as concerns quality and permanency. It is evident that neither type can be adopted for general use unless the cost of the materials and the freight charges for transporting them are reduced to the lowest point possible.

It seems apparent that not less than 2700 miles of State Highway must be built to comply with the provisions of the "State Highways Act." Of this mileage it is possible that one-third, or 900 miles, will be in the mountains, and will require no surfacing other than local gravel, and that 1800 miles will have to be surfaced with materials more or less expensive.

FREIGHT RATES ON ROAD MATERIALS.

The Commission has been negotiating with the Southern Pacific Company concerning freight rates on materials needed in the construction of the roads.

It is obvious that to secure a high type of work on the main routes, many tons and cubic yards of broken stone, gravel, cement, oil and other materials must be carried by rail, sometimes for long distances, since rarely will such materials be found within wagon haul distance of the work to be done. The cost of railroad freight will, therefore, be a very large item in the cost of the roads.

A crude estimate shows that the Southern Pacific Company will be concerned in hauling materials for not less than 1000 miles of the State Highway. Otherwise expressed, should the 1000 miles referred to be built of oil macadam, the railroad will have to transport not less than 2,900,000 tons of broken stone and 260,000 barrels of asphaltic oil during the progress of the work, to say nothing of huge quantities of cement, culvert pipe, lumber, reinforcing steel, etc.

The new rates just agreed upon are as follows for any length of haul:

Stone, gravel and sand	$\frac{1}{2}$ cent per ton per mile, with a \$6 per car minimum, exclusive of mountain hauls.
Road oil and bituminous rock	$\frac{3}{4}$ cent per ton per mile; minimum, \$10 per car.
Asphalt	1 cent per ton per mile, whether in tank, cars or packages; minimum, \$10 per car.
All other commodities	(a) The lowest of any commercial rate, or (b) one-half of any class rate; minimum, \$10 per car.

The latter rate will include cement, steel, culvert pipe and other miscellaneous materials, together with contractors' equipment when shipped marked California Highway Commission.

The writer has not had time to even approximate the probable savings in cost due to these reductions in rates, but it is safe to say that it will be some hundreds of thousands of dollars, all of which will inure to a higher quality of surfacing. Considering the stone, gravel and sand rate alone, the lowest rate heretofore with which the writer is familiar was $\frac{3}{4}$ cent per mile per ton up to a sixty-mile haul, with slowly reducing rates for hauls to 150 miles, the rate for the extreme haul being $\frac{1}{2}$ cent per ton. The minimum rate under that arrangement was 25 cents per ton (about \$12.50 per car).

The writer does not believe that the concession in freight rates by the Southern Pacific Company is merely what has been sometimes called "enlightened self-interest." In part, at least, he believes it to be due to the

desire of the company that the roads be built of the best materials procurable and in the best manner. The instructions of the President of the company to his heads of departments to make the reductions in rates as general, as broad and as low as was consistently possible indicate the good will of the management of the Southern Pacific Company toward the State Highway project.

ROADS UNDER CONTRACT AND ADVERTISED FOR BIDS.

There are now 37½ miles of State Highway under contract in widely separated parts of the State, and 58 miles more are now under advertisement, the bids to be opened during the last week of the present month.

Of the roads under contract, 13 miles are in Mendocino County, south of Hopland, where the work consists in re-locating and grading the road over the mountains, the rate of grade being reduced from a present maximum of over 12% to a 7% minimum.

Five and four-tenths miles are in San Mateo County, where sheet asphalt 24 feet wide on a 5-inch concrete base is being laid.

Nine miles are in Yuba County where the road has been entirely relocated, and oiled macadam 15 feet wide is to be laid.

On all the roads now advertised and awaiting contract, it is proposed to use a hydraulic cement concrete base 15 feet wide, covered with a thin surface of a bituminous mixture.

Whether or not much additional work of this character may be done depends largely upon the cement manufacturers.

It is probable that they will make some deduction in the cement price to induce the Commission to adopt the concrete base for its standard type of construction. Whether the reduction in price will be sufficient to permit of so general a use of concrete is not yet determined.

CONCLUSION.

Notwithstanding the sporadic outbursts in the press which are, of course, due to the most part to the heated political atmosphere which prevails at the present time, the general sentiment of the people of the State is remarkably friendly toward the State Highway work.

The counties have generously agreed to furnish such rights of way as are needed for re-locating the roads, and the Commission expects that none of the bridges of the State which are more than 20 feet in span will have to be built with money from the highway fund. Thus far no county has refused to reconstruct such bridges or to build new ones when the Commission has made the request.

Of the thirty-one survey parties now at work, eighteen are located on the coast highway between Willits on the north and San Diego on the south.

Every effort is being made to have the main State Highway routes completed before the great Exposition at San Francisco opens its doors in 1915.